

CLAIMS

- Sub B1
1. A stamping process in which a metal sheet T is stamped between a bottom die 10 and a punching die 4 clamped by front (AV) and rear (AR) blank holders, *characterized in that* the blank holder AR 20 is widened toward the rear relative to the dimensions of the prior art and, at the end adjacent to the punching die 4 (that is, the front (AV) end of the rear (AR) blank holder), has a convex form, that is, a form which permits progressive deformation of the metal sheet in depth and over a greater blank holder length, in place of the right angle of blank holders of the prior art.
2. A stamping process in which a metal sheet T is stamped between a bottom die 10 and a punching die 4 clamped by front (AV) and rear (AR) blank holders, *wherein* the rear blank holder (AR) 20 is widened toward the rear and is geometrically adapted to the level of the area 14 adjacent to the punching die 4 in order to reproduce at least one part of the form created by the punching die 4 in its AV part, or to reproduce precisely one-half, or more than one-half, up to the entirety of the form created by the punching die 4.
- Sub A17
3. The stamping process as specified in claim 1 or 2, *wherein* the front blank holder (AV) 30 is also widened (toward the front).

4. The stamping process as specified in any of claims 1 to 3, *wherein* the geometric adaptation of the blank holder AR represents one-half the form created by the punching die 4 in its AV part.

5. The stamping process as specified in any of claims 1 to 4 adapted for manufacture of multiple-seat benches, in particular ones with two to six or eight seats or more, requiring several consecutive seat forms or imprints 11, 12 separated by interval *i*, *wherein* use is made of a tool the AR blank holder 100 of which reproduces (in its part B) at least one part, preferably precisely one-half (A) of the seat form 11, 12 created by the punching die 120 in its AV part, or creates more than one-half, up to the totality, of the form created by the punching die.

6. The stamping process as specified in claim 5 adapted for manufacture of multiple-seat benches, in particular with six to eight or more seats, requiring a plurality of consecutive seat forms or imprints 11, 12 separated by an interval *i*, *wherein* the blank holder AR 100 and the punching die 120 are in an area the geometry of which is adapted for reproduction of the desired form of the interval *i* defined as mandatorily present between two consecutive seat forms.

Sub 27. The stamping process as specified in claim 5 or 6 adapted for manufacture of multiple-seat benches, in particular ones with two to six or eight or more seats, requiring a plurality

of consecutive seat forms or imprints 11, 12 separated by an interval  $i$ , *wherein* the blank holder has been widened toward the front.

8. The stamping process as specified in any of claims 5 to 7, adapted for manufacture of multiple-seat benches, in particular ones with two to six or eight or more seats, requiring a plurality of consecutive seat forms or imprints 11, 12 separated by an interval  $i$ , *wherein* the profile 8 of the blank holder AV 110 remains horizontal.

9. The stamping process as specified in any of claims 5 to 7, *wherein* the blank holder 110 may have a slightly convex surface or profile favoring transition in deformation from the metal sheet to the punching die.

10. The stamping process as specified in any of claims 1 to 9, *wherein* the metal sheet T is positioned so as to produce a first stamping form or "initial stamping," then the metal sheet which has undergone this initial stamping is then displaced toward the rear and the initial stamping is brought to rest in area 130 AV of the blank holder AV of the blank holder AR 100, after which the second stamping is carried out and so forth until 2, 3, 4, 5, 6, 7, or 8 imprints or more have been produced.

11. The stamping process as specified in any of claims 1 to 10, *wherein* the blank holder AR 100 reproduces in its part B one-half of the seat imprint, which is identical to half-form

A of part AV of the punching die 120, the arrow indicating the direction of step-by-step movement of the metal sheet to permit production of consecutive imprints.

12. The stamping process as specified in any of claims 1 to 11, *wherein* the tool comprises, between the blank holder AR 100 and the punching die 120, a shoulder 150 which reproduces the interval *i* which must be present between two consecutive seat imprints.

13. The stamping process as specified in any of claims 1 to 12, *wherein* a pressure of the order of 150 to 300 or 350 to is applied for a metal sheet of 15/10 mm or of 12/10 mm or of 10/10, 8/10, or 6/10 mm.

14. The stamping process as specified in any of claims 1 to 13, *wherein* this shoulder 150 forming interval *i* is reduced to values of the order of 1 to 3 or 5 cm for 15/10 mm metal sheets, or even one measuring 10/10 or 8/10 or 6/10 mm, or even preferably to a value *i* = 0, without marking and without folds or curls.

15. The stamping process as specified in any of claims 1 to 14, *wherein* at least one part of base part B of blank holder AR 100 is replaced with other support means, such as friction rollers, etc.

16. The stamping process as specified in any of claims 1 to 15, *wherein* the stamping process comprises a metal sheet preforming step, preferably preforming by means of a folding machine.

17. The stamping process as specified in claim 16, *wherein* the metal sheet is preformed along line a, b, c, rounded part d, e, f, all sections being straight except curved section d, or the preform is made up of sections a, h (straight), d, e, f, or the preform is made up of sections a, h (straight), d, g (straight).

18. The stamping process as specified in any of claims 1 to 17, *wherein* the metal sheet T is positioned without concern for vertical alignment with the punching die 4 and the punching die 10, it being possible for the metal sheet to be offset, for example, by distance m relative to the vertical alignment, and *wherein* the press is then lowered slowly and the metal sheet is allowed to center itself on the tool.

19. A tool for application of the stamping process as specified in any of claims 1 to 18, *characterized in that* such tool comprises a bottom die 10 and a punching die 4 clamped by front (AV) and rear (AR) blank holders, and *in that* the blank holder AR 20 is widened toward the rear in comparison to the dimensions of the prior art and has on the end adjacent to the punching die 4 (that is, the front end of the rear extremity) a convex shape, that is, a shape which permits progressive deformation of the metal sheet in depth, and

over a greater blank holder length in comparison to the right angle of blank holders of the prior art.

20. The tool as specified in claim 19, *wherein* the rear blank holder (AR) 20 is widened toward the rear and is geometrically adapted at the level of area 14 adjacent to the punching die for reproduction of at least one part of the form created by punching die 4 in its AV part, or one-half or more than one-half, and up to the entirety of the form created by the punching die.

21. The tool as specified in claim 19 or 20, *wherein* the blank holder (AV) 30 is also widened (toward the front).

22. The tool as specified in any of claims 19 to 21, *wherein* geometric adaptation of the blank holder AR reproduces in its part B one-half A of the shape created by the punching die in its part AV.

23. The tool as specified in any of claims 19 to 22 adapted for manufacture of multiple-seat benches requiring a plurality of consecutive seat forms or imprints 11, 12, in particular two to six or eight seats or more, separated by an interval *i*, *wherein* blank holder AR 100 reproduces at least one part, preferably one-half the seat form produced by the punching die 120 in its AV part, or reproduces more than one-half, up to the entirety, of the form created by the punching die.

24. The tool as specified in any of claims 19 to 23 adapted for manufacture of multiple-seat benches, requiring a plurality of consecutive seat forms or imprints 11, 12 separated by an interval *i*, in particular two to six or eight seats or more, *wherein* there is between the blank holder AR and the punching die 120 an area 150 the geometry of which is adapted for reproduction of the desired shape of the interval *i* defined as mandatorily present between two consecutive seat forms, *i* optionally equaling zero.

25. The tool as specified in any of claims 19 to 24 adapted for manufacture of multiple-seat benches, in particular two to six or eight or more consecutive seat forms or imprints 11, 12 separated by an interval *i*, *wherein* the blank holder AV 110 has been widened toward the front.

26. The tool as specified in any of claims 19 to 25 adapted for manufacture of multiple-seat benches, in particular two to six or eight or more consecutive seat forms or imprints 11, 12 separated by an interval *i*, *wherein* the tool comprises between the blank holder AV 100 and the punching die 120 a shoulder 150 which reproduces the interval *i* which must be present between two consecutive seat imprints.

27. The tool as specified in any of claims 19 to 26, *wherein*, in order that the stamping pitch may be modified as desired, the tool is designed in two separate parts by a transverse cut (that is, one perpendicular to the direction of advance of the metal sheet) at the level of the center of the punching die (4, 120), this forming the base tool at minimum pitch,

which parts may be separated from each other by the desired pitch modification value E, and *wherein* the tool comprises one or more sets of four dismountable pieces called bottom die 460, punching die 480, and blank holder 490 and 420 shims adapted for insertion into space E in an appropriate set.

28. The tool as specified in claim 27, *wherein* such tool is adapted for manufacture of multiple-seat benches, in particular for two to six or eight seats or more, requiring a plurality of consecutive seat forms or imprints 11, 12 separated by an interval i.

29. The tool as specified in claim 26, or 27, *wherein* such shims of bottom die 460, punching die 48, and blank holder 49 and 20 may be fastened by any mechanical means such as bolting, etc.

30. Stamping presses equipped with a tool as specified in any of claims 19 to 29.

31. Stamped articles and products, in particular ones such as include successive repetitive imprints, in particular whenever the imprints are close together, or even adjacent ( $i = 0$ ), and in particular benches with a plurality of seats, in particular six or more, in particular two to six or eight seats or more, *characterized in that* such stamped articles and products have been manufactured by a process as specified in any of claims 1 to 18 or with a tool as specified in any of claims 19 to 29 or by means of a press as specified in claim 30.



32. Stamped articles as specified in claim 31, *wherein* such articles are made with metal sheets of various customary thicknesses, in particular 15/10, 12/10, or 10/10 mm, of various common or stainless steels, optionally provided with a temporary, provisional, or definitive coating, or under a finishing layer, or again made of plates of plastics or composites of any type.

33. Sets of bottom die 460, punching die 480, and blank holder 490 and 420 shims as specified in Claim 27.